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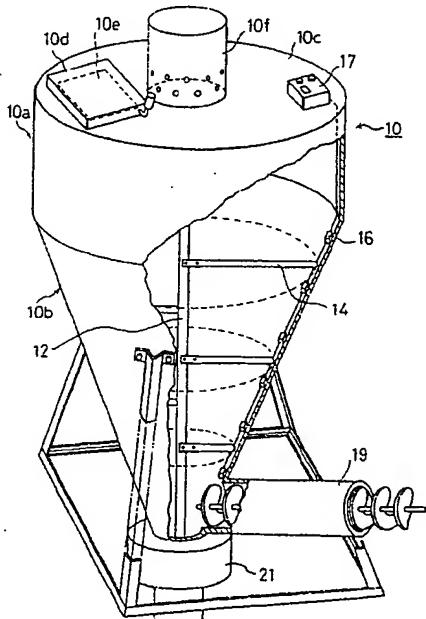
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**(54) GARBAGE DISPOSING DEVICE**

(57) A garbage disposing device 1, comprising a disposing tank 10 of substantially the inverted-conical shape for storing organic substance such as garbage and fermentation accelerator additives in which fermentation microorganism is seeded beforehand in a sealed condition, a rotating shaft 12 which passes vertically through the disposing tank 10 and is driven to rotate by a motor connected to the lower or upper end thereof, a plurality of cutter blades 14 which are fixed in a cantilevered fashion to the rotating shaft 12 at intervals in the vertical direction for grinding and mixing the fermentation accelerator additive and the organic substance, and a plurality of thermo sensors 16 for detecting the temperatures of the disposing tank at a plurality of portions positioned at intervals in the vertical direction.

Grinding and mixing can be performed sufficiently with the fact that rotating resistance is small at all vertical positions of the disposing tank 10 because it is formed in the inverted-conical shape and grinding and mixing is performed by a plurality of cutter blades 14 mounted on the rotating shaft 12.

Fig. 1



**Description****Field of the Invention**

[0001] The present invention relates to a middle-sized garbage disposing device that fermentates and disposes organic substance such as leftovers and raw garbage and changes them into compost in a short time efficiently.

**Background of the Technology**

[0002] Conventionally, a middle-sized garbage disposing device that disposes and changes raw garbage into compost is recognized as the middle of small one for house and big one for industry that is equipped with a grinding device, a mixing device and a fermentation disposal tank. A typical example of the middle size garbage disposing device is shown in Figure 3. As indicated, a conventional garbage disposing device 3 comprises a generally cylindrical disposing tank 30 for storing organic substance such as garbage and fermentation accelerator additives in which fermentation microorganism is seeded beforehand in a sealed condition, a rotating shaft 32 which passes vertically through the disposing tank 30 and is driven to rotate by a motor (not shown) connected to the lower end of the disposing tank, a cylinder 33 having a peripheral wall that is disposed at the upper side of and concentrically around the rotating shaft 32 and has many holes 33a thereon, and a screw blade 34 which is set in a spiral and is disposed on the rotating shaft 32 from the below to the inside of the cylinder 33.

[0003] The method of using this garbage disposing device is as follows. As preparation process, a predetermined amount of the fermentation accelerator additive 35 in which the fermentation microorganism is seeded beforehand is put on bottom of the disposing tank. This additive 35 is made up of bacteria that is cultured from many kinds of microorganism in the soil and small wood chip of wood. Raw garbage (maximum 500 kg) is thrown to the additive from a raw garbage entrance 30a of the disposing tank 30. The motor is driven to rotate the rotating shaft 32 at a speed of 70 rounds/min. The fermentation accelerator additive 35 and the raw garbage are guided in the cylinder 33 by the screw blades 34 fixed on the rotating shaft 32 and are elevated in the inside thereof. Since there are many holes 33a on the cylinder 33, the fermentation accelerator additive and the raw garbage are subjected to receive the power of cutting so that they are broken into small pieces, are pressed into the holes 33a and fall down on the bottom of the disposing tank 30.

[0004] In this way, after they are grounded and mixed sufficiently, the motor is stopped operating and they are left for, for example, two or three days. During this time period, the raw garbage is resolved into carbonic acid gas and water due to work of bacteria so that good and

homogeneous compost is produced.

[0005] Considering from the view point of processing efficiency in said raw garbage disposing device 3, it is necessary to grind and mix the fermentation accelerator additive and organic substance sufficiently as well as to proceed fermentation disposal equally at the upper, the middle and the lower part of the disposing tank 30. Figure 4 represents the temperature change in the lower part of the disposing tank 30 in case that the raw garbage was thrown into the disposing tank 30 of the conventional garbage disposing device 3 at levels of 40 cm, 55cm and 67 cm high, respectively, (The experiment for each height had done in twice.) As a result, it is found that the fermentation disposing shall progress rapidly in proportion to the amount of the raw garbage put into the disposing tank 30 as long as the motor rotating the rotating shaft 32 permits. In other words, when fermentation disposal progressed, the temperature of disposal materials thrown into and grounded and then mixed was going up. As it is shown in Figure 4, the higher the raw garbage were thrown into, the higher the temperature of the fermentation disposal was or the fermentation progressed.

[0006] Next, the raw garbage was thrown into the disposing tank 30 to 65 cm in height, the change of the temperature in lower, middle and upper part of the disposing tank were checked under the same condition as described above (refer to the Figure 5). As a result, there was a more than 10 degree difference in temperature between the lower and the upper part of the disposing tank 30 during a period from 30 minutes to two hours after the beginning of disposing. Furthermore, there was a drawback that the progress of disposing became slow, because of 5 ~ 6 degree difference in temperature even after 7 hours passed from the beginning of disposing.

[0007] The purpose of the present invention is to solve the above drawback of the conventional garbage disposing device and offer a garbage disposing device that is able to perform fermentation disposal at almost the same progress condition in all the height of a disposing tank.

**Description of the Invention**

[0008] The present invention to solve above drawback is to provide a garbage disposing device comprises a disposing tank having decreasing radius of a circle in a horizontal cross section downwardly for storing organic substance such as garbage and fermentation accelerator additives in which fermentation microorganism is seeded beforehand in a sealed condition, a rotating shaft which passes vertically through the disposing tank and is driven to rotate by a motor connected to the lower or upper end of the disposing tank, a plurality of cutter blades which are fixed in a cantilevered fashion to the rotating shaft at intervals in the vertical direction for grinding and mixing the fermentation accelerator additive and the organic substance, and a plurality of thermo

sensors for detecting the temperatures of the disposing tank at a plurality of portions positioned at intervals in the vertical direction.

[0009] Grinding and mixing can be performed sufficiently with the small rotating resistance at a various vertical positions of the disposing tank because the disposing tank is formed to have decreasing radius of a circle in a horizontal cross section downwardly and the grinding and mixing is performed by the plurality of cutter blades mounted on the rotating shaft.

[0010] In the garbage disposing device defined in the claim 1, the present invention defined in the claim 2 is characterized in that the disposing tank forms in an inverted-conical shape inclination of which to the vertical direction is 20-50 degrees.

[0011] Under this range of angle, the rotating resistance loaded over the cutter blades becomes small in efficient, because it is supported by the wall that a part of the load from the upper part of the raw garbage that is thrown or put into the disposing tank.

[0012] In the garbage disposing device defined in the claim 1 or 2, the present invention defined in the claim 3 is characterized in that the height of the disposing tank is 100 or less.

[0013] To perform grinding and mixing the fermentation accelerator additive and the organic substance sufficiently, it needs rotating speed of about 110 rounds/min. When a general-use motor available with low cost, the height of the disposing tank forms to 100 or less to avoid excessive load to motor.

[0014] In the garbage disposing device defined in the claim 3, the present invention defined in the claim 4 is characterized in that an entrance of the organic substance to the disposing tank is formed on the top of this disposing tank and an outlet of disposed compost from this disposing tank is formed at the bottom of this disposing tank.

[0015] By forming the entrance of the organic substance on the top of the disposing tank, the organic substance can be thrown into the disposing tank easily only by releasing the organic substance after conveying the same above the entrance. By forming the outlet for the disposed compost at the bottom of this disposing tank, all compost can be discharged outside of the disposing tank easily, because it falls down to be gathered toward the bottom of the disposing tank having decreasing radius of a circle in a horizontal cross section downwardly or an inverted conical shape along the slope of the tank.

[0016] In the garbage disposing device defined in the any of the range of claim 1-4, the present invention defined in the claim 5 is characterized in that it checks or monitors temperature of disposing at least in the upper, middle and lower parts of the disposing tank and detects the transitions to temperature raising period, temperature perpetuated period and temperature dropping period, re-grinds and re-mixes them by rotating the motor according to necessity, discharges the disposed compost from the bottom of the disposing tank, and/or

throws or puts new organic substance such as raw garbage into this disposing tank.

[0017] The progress condition of the fermentation disposal can be detected from the temperatures at a various of positions of the disposing tank and shall be controlled with using them as parameters to make fermentation disposal throughout of the disposing tank homogeneous and efficient.

#### 10 Brief Explanation of the Drawings

##### [0018]

15 Figure 1 is a general schematic view showing an embodiment of a garbage disposing device according to the present invention.

20 Figure 2 is a graph showing the change of temperature in the lower, middle and upper parts of the disposing tank wherein raw garbage are disposed by using the garbage disposing device according to the present invention.

25 Figure 3 is a general schematic view of the conventional garbage disposing device.

30 Figure 4 is a graph showing the change of temperature at the lower part of the disposing tank wherein raw garbage was put into the disposing tank of figure 3 to 40cm, 55cm and 67cm in height and then was subjected to fermentation disposal.

35 Figure 5 is a graph showing the change of temperature in the lower, middle ad upper parts of the disposing tank wherein raw garbage was subjected to fermentation disposal by using the garbage disposing device of figure 3.

#### 35 The Best Mode for Carrying Out the Invention

[0019] A detailed explanation of garbage disposing device according to the present invention will be made with referring drawings of the best mode for carrying out the invention.

[0020] Figure 1 is a general schematic view showing an embodiment of a garbage disposing device according to the present invention.

[0021] A garbage disposing device 1 according to the present invention comprises a generally inverted-conical disposing tank 10, a rotating shaft 12 which passes vertically through and is supported by the disposing tank, a plurality of cutter blades 14 which are fixed to the rotating shaft at intervals in vertical direction and a plurality of thermo sensors 16 for detecting the temperatures of the disposing tank at a plurality of portions positioned at intervals in vertical direction.

[0022] The disposing tank 10 is a container that can store in a sealed fashion. The disposing tank 10 is made of metallic materials having mechanical strength and durability and is formed to a substantially inverted-conical shape. In the preferred embodiment as shown, a cylinder part 10a is provided at the upper portion of the

disposing tank 10. This cylinder part 10a has a space to store raw garbage the amount of which is more than that of disposing material grounded and mixed at an inverted-conical part 10b. Raw garbage reduces its volume by grinding and it reduces fairly volume as fermentation disposing progresses, so the raw garbage stored in the cylinder part 10a falls down into the inverted-conical part in order. In that situation, it needs to drive the motor to grind and mix the disposing material again, because the raw garbage in the cylinder part 10a is not grounded and mixed yet.

[0023] At a top 10c of the disposing tank 10, a raw garbage entrance 10e covered with a lid 10d that is capable of opening and closing and an exhaust duct 10f that discharges carbonic acid gas and steam produced in the disposing tank 10 are provided. Also, a control board 17 is set at the top 10c. The control board receives signals from a plurality of thermo sensors 16 and controls appropriately in accordance with commands set in advance.

[0024] The reversed-conical part 10b of the disposing tank 10 is formed in an inverted-conical shape inclination of which to the vertical direction is 20-50 degrees. Under this range of angle, the rotating resistance loaded over the cutter blades 12 becomes small in efficient, because it is supported by the wall that a part of the load from the upper part of the raw garbage that is thrown or put into the disposing tank.

[0025] At a bottom of this disposing tank 10, a screw conveyor 19 that discharges disposed compost is provided. All compost can be discharged outside of the disposing tank easily, because it falls down toward the bottom of the disposing tank 10 along the slope of the inverted-conical part 10b of the disposing tank 10.

[0026] At lower end of the rotating shaft 12, a general-purpose motor 21 available with lower cost is provided. To perform grinding and mixing the fermentation and organic substance (disposing material) sufficiently, it needs to rotate the rotating shaft 12 at about 110 rounds/min. When the general-purpose motor is used, the height of the disposing tank 10 shall be 100cm or less to avoid excessive load to the motor.

[0027] Also, a plurality of cutter blades 14 which are fixed to the rotating shaft 12 in a cantilevered fashion by using fastening members such as bolt and nut at intervals in the vertical direction. In a preferred embodiment shown in the drawing, the cutter blades 14 are thin and metal stick, but of course any forms of cutter blades may be used.

(Experiment)

[0028] The fermentation accelerator additive in which the fermentation microorganism is seeded beforehand and the raw garbage were thrown into the disposing tank 10 to 65cm in height and the rotating shaft 12 was rotated at the speed of 110 rounds/min for 15 minutes. After the fermentation accelerator additive and raw gar-

bage were grounded and mixed sufficiently, we checked temperature in the lower, the middle and the upper parts of the disposing tank 10 by using the thermo sensors 16 (refer to the figure 2).

5 [0029] As it is indicated in the figure 2, there was about 5 degree difference in temperature between the lower, the middle and the upper parts of disposing tank 10 for 45 minutes after starting to rotate the motor 21. However, when it passed 60 minutes after starting to rotate the motor 21, there was little difference in temperature between them. Furthermore, it entered into the temperature perpetuated period or a 75 degree zone, when it passed 2 hours after starting to rotate the motor 21. It improved the speed of fermentation greatly, compared to 7 hours in the case of the figure 5. And also, the temperature itself in the temperature perpetuated period is up 2 to 5 degrees compared to the case of the figure 5 and processing efficiency is improved.

10 [0030] This is assumed that grinding and mixing can be performed sufficiently by a plurality of cutter blades 14 mounted on the rotating shaft 12 with the fact that rotating resistance is small at all vertical positions of the disposing tank 10 because the disposing tank 10 is formed in the inverted-conical shape.

15 [0031] In the garbage disposing device 1 according to the present invention, there is a merit not to cost plant investment because it doesn't need a grinding device. Although big head of fishes and bones of pigs are left in compost as bones, all parts of meat are subjected to fermentation disposal and changed to compost. The bones in compost can separate from the compost by using a sieve easily.

20 [0032] A garbage disposing device according to the present invention, comprising a disposing tank of substantially the inverted-conical shape for storing organic substance such as garbage and fermentation accelerator additives in which fermentation microorganism is seeded beforehand in a sealed condition, a rotating shaft which passes vertically through the disposing tank and is driven to rotate by a motor connected to the lower or upper end of the disposing tank, a plurality of cutter blades which are fixed in a cantilevered fashion to the rotating shaft at intervals in the vertical direction for grinding and mixing the fermentation accelerator additive and the organic substance, and a plurality of thermo sensors for detecting the temperatures of the disposing tank at a plurality of portions positioned at intervals in the vertical direction, whereby grinding and mixing can be performed sufficiently with the fact that rotating resistance is small at all vertical positions of the disposing tank. Thus, it is able to be fermentation disposal at almost the same progress condition in all the height position of the disposing tank and as a result, it has effects to carry out fermentation disposal homogeneously and rapidly.

**Claims**

1. A garbage disposing device comprises,  
a disposing tank of substantially the inverted-conical shape for storing organic substance such as garbage and fermentation accelerator additives in which fermentation microorganism is seeded beforehand in a sealed condition, 5  
a rotating shaft which passes vertically through the disposing tank and is driven to rotate 10 by a motor connected to the lower or upper end of the disposing tank,  
a plurality of cutter blades which are fixed in a cantilevered fashion to the rotating shaft at intervals in the vertical direction for grinding and mixing 15 the fermentation accelerator additive and the organic substance, and  
a plurality of thermo sensors for detecting the temperatures of the disposing tank at a plurality of portions positioned at intervals in the vertical direction. 20
2. The garbage disposing device defined in the claim 1 being **characterized in that** the disposing tank forms in an inverted-conical shape inclination of 25 which to the vertical direction is 20-50 degrees.
3. The garbage disposing device defined in the claim 1 or 2 being **characterized in that** the height of the disposing tank is 100 or less. 30
4. The garbage disposing device defined in the claim 3, the present invention defined in the claim 4 is **characterized in that** an entrance of the organic substance to the disposing tank is formed on the top of this disposing tank and an outlet of disposed compost from this disposing tank is formed at the bottom of this disposing tank. 35
5. The garbage disposing device defined in the any of the range of claim 1-4, the present invention defined in the claim 5 is **characterized in that** it checks or monitors temperature of disposing at least in the upper, middle and lower parts of the disposing tank and detects the transitions to temperature raising period, temperature perpetuated period and temperature dropping period, re-grinds and re-mixes them by rotating the motor according to necessity, 45 discharges the disposed compost from the bottom of the disposing tank, and/or throws or puts new organic substance such as raw garbage into this disposing tank. 50

Fig.1

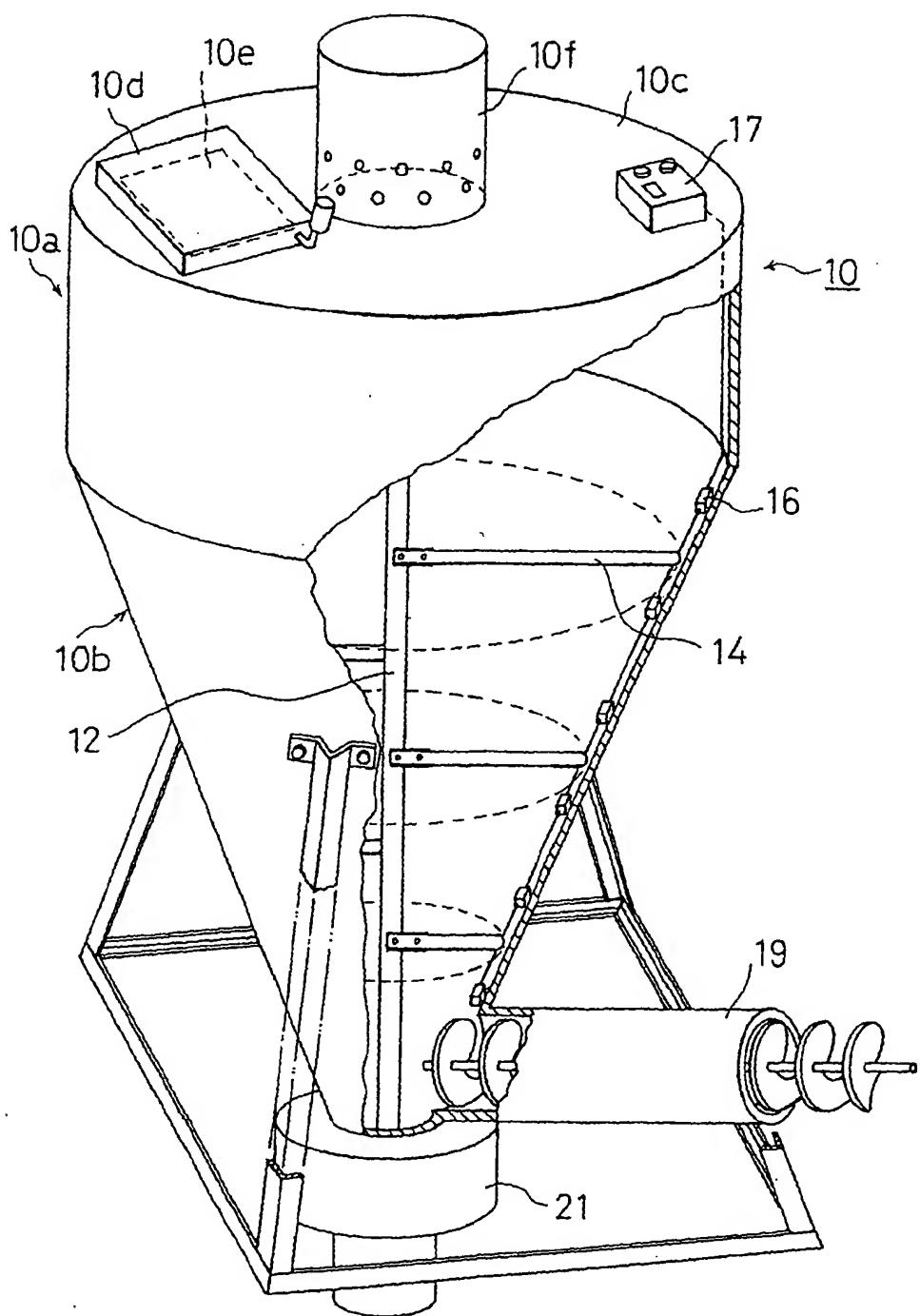


Fig. 2

The change of temperature in the fermentation disposal tank

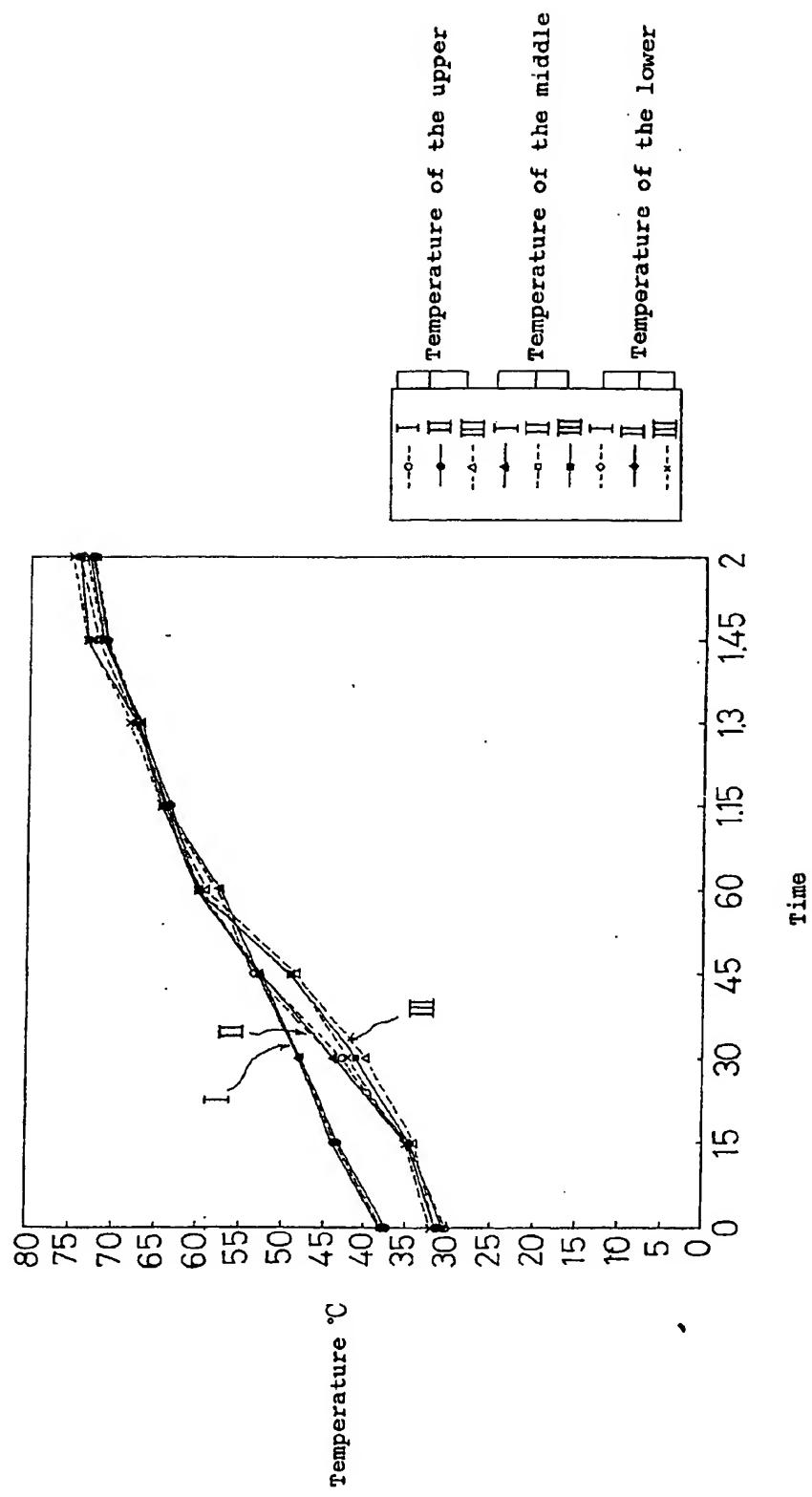


Fig.3

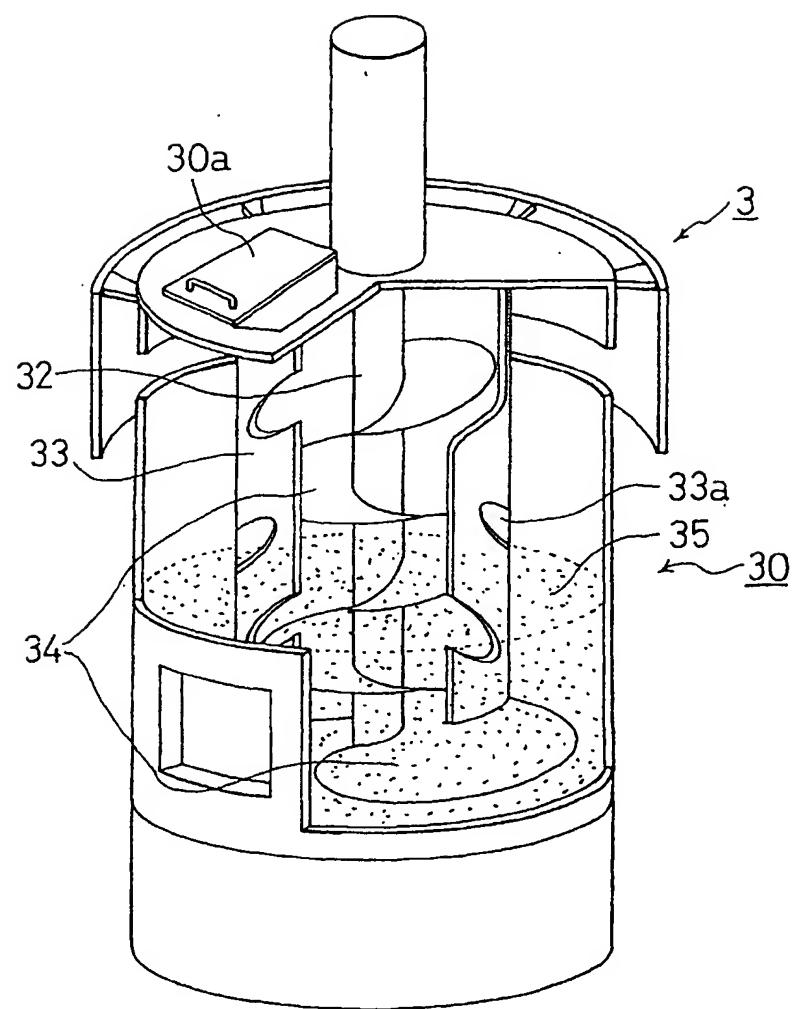


Fig. 4

The change of temperature in the fermentation disposal tank

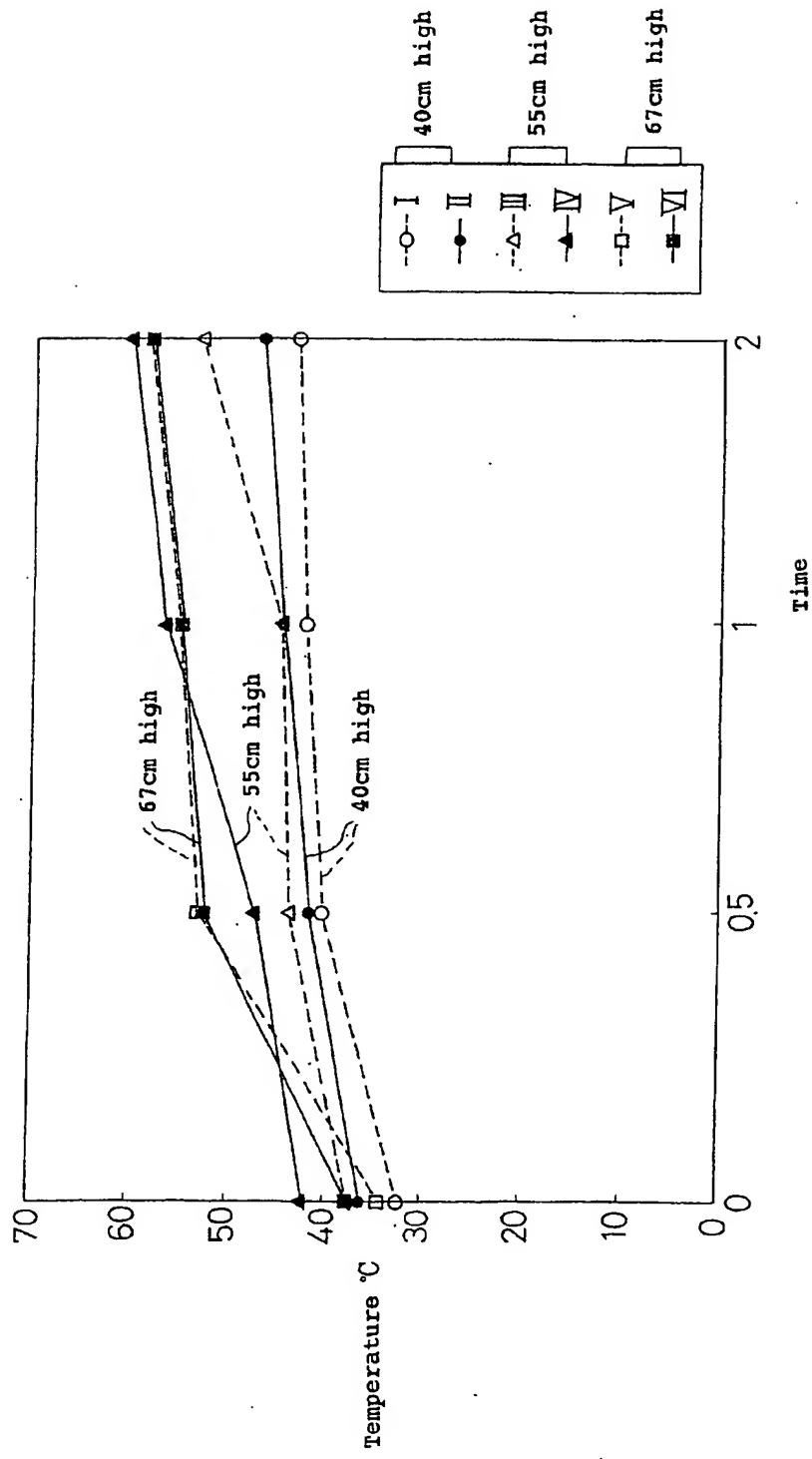
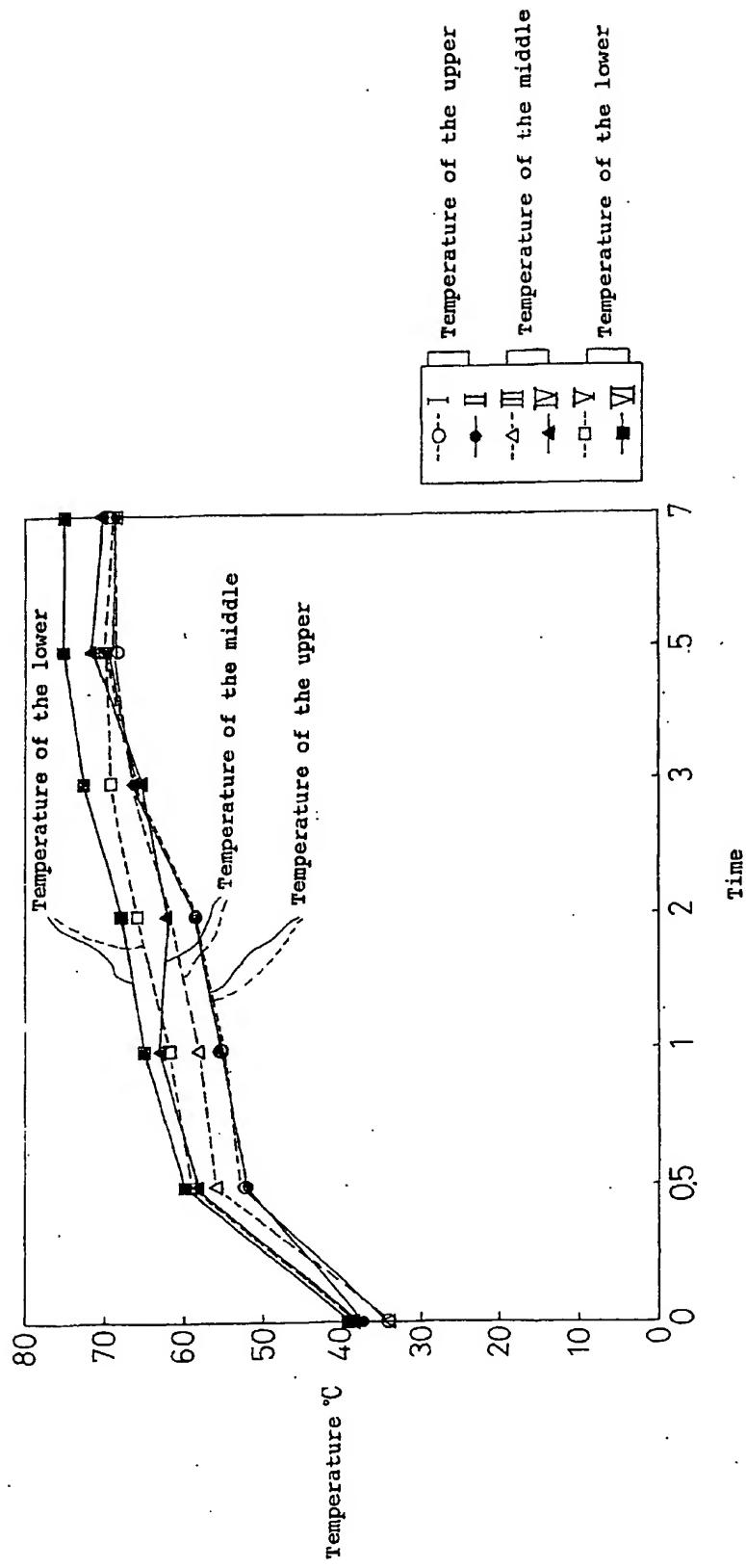


Fig. 5

The change of temperature in the fermentation disposal tank



INTERNATIONAL SEARCH REPORT		International application No. PCT/JP99/02382
<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int.Cl <sup>6</sup> B09B3/00, C05F9/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) Int.Cl <sup>6</sup> B09B3/00, C05F9/02, C02F11/02		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-1999 Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Keisai Koho 1996-1999		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category <sup>8</sup>	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
EX	JP, 11-199356, A (Yuichi Ueda), 27 July, 1999 (27. 07. 99), Claims ; Fig. 1 (Family: none)	1-5
Y	JP, 9-234498, A (Kawasaki Butsuryu K.K.), 9 September, 1997 (09. 09. 97), Column 3, lines 3 to 33 ; Fig. 4 (Family: none)	1-5
Y	JP, 10-180228, A (Mitsubishi Materials Corp.), 7 July, 1998 (07. 07. 98), Column 8, line 22 to column 10, line 12 ; Fig. 1 (Family: none)	1-5
Y	JP, 51-145767, A (J.R. Kaelin), 14 December, 1976 (14. 12. 76), Page 3, lower right column, line 20 to page 5, upper left column, line 9 ; Fig. 1 & BE, 842271, A1 & DE, 2527195, A1 & FR, 2312474, A1 & AT, 466475, A & GB, 1552353, A	1-5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search 3 August, 1999 (03. 08. 99)		Date of mailing of the international search report 10 August, 1999 (10. 08. 99)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
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INTERNATIONAL SEARCH REPORT		International application No. PCT/JP99/02382
C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 11-1381, A (Yuuichi Ueda), 6 January, 1999 (06. 01. 99), Claims ; Fig. 1 (Family: none)	5